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PATENT SPECIFICATION

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(19)

(54) SHAVING SYSTEM

(71) We, THE GILLETTE COMPANY, a corporation organised under the laws of the State of Delaware, United States of America, of Prudential Tower Building, Boston, State of Massachusetts, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to shaving systems.

Numerous efforts have been made to devise improved shaving systems which provide both a close shave and a safe shave (i.e., a shave with minimal risk of cuts and nicks), and it is a principal object of this invention to provide a novel and improved shaving system having such characteristics. Recently plural edge shaving systems which provide enhanced shaving have become commercially available. It is a further object of this invention to provide a novel and improved shaving system having shaving characteristics comparable to such plural edge systems but in which a single cutting edge may be employed.

In accordance with the invention there is provided a shaving system comprising a blade member having a cutting edge, a platform member of molded plastics material supporting said blade member, a skin engaging guard of molded plastics material positioned forwardly of said cutting edge, and a supplemental member of molded plastics material and integral with said platform member and said guard fixed in position between said guard member and the cutting edge of the blade member, said supplemental member having a hair-engaging edge portion disposed parallel to the cutting edge, said hair-engaging edge portion having a radius relative to the diameter of hair elements to be shaved such that, in the course of a shaving stroke, said edge portion engages hairs and produces localized distortion therein to exert a grasping effect on th individual engaged hairs which pulls them outwardly from their follicles as the shaving system is moved over the skin surface.

The force exerted on the individual hair elements is less than the pain threshold, that threshold for outward pull on beard hair generally being about 9—10 grams. In preferred embodiments, the edge of the hair-engaging edge portion has an effective radius in the range of 2—50 microns (which may be contrasted with the edge radius of a new razor blade, a typical value of which is in the order of 0.03—0.05 microns, the radius of the conventional guard which is in the order of 1750 microns). The hair engaging edge portion is spaced from the cutting edge such that in a normal shaving stroke the hair element is pulled out and released prior to engagement by the cutting edge of the blade member.

The supplemental structure is a sturdy member which is made of plastics material. It provides a well-defined edge which is interposed between the conventional guard surface of reatively large radius and the platform structure for supporting the blade member and which projects forwardly (on the skin side) of a plane tangent to the leading edge of the platform and the guard structure. It is positioned between leading and following skin engaging surfaces (e.g., the guard and the blade edge); is preferably spaced forward of the blade edge a distance in the range of about three-quarters to two millimeters; and the perpendicular distance of its edge from a reference plane defined by the skin engaging guard and the blade edge is preferably in the range of −20 microns to +50 microns. The blade member is preferably disposed at an angle in the range of 20° to 32° to this reference plane.

The invention provides an efficient shaving system with a single blade edge. In a particular geometry, an exceptionally close shave can be obtained without skin irritation, as the hair engaging element pulls the hair outwardly from the follicle for engagement and subsequent cutting by the blade edge. Aft r the hair is cut, the root end rec des to its original position within the follicl .

retracting the cut end so that effectiv ly a closer shave is obtained than with a comparable single blade system.

Other objects, features and advantages of the invention will be seen as the following description of particular embodiments progresses, in conjunction with the drawings, in which:—

Fig. 1 is a perspective view of a shaving system in accordance with the invention;

Fig. 2 is an enlarged sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a further enlarged view showing aspects of the geometry of the system shown in Fig. 1;

Fig. 4 is a diagrammatic indication of the dynamic operation of the shaving system shown in Figs. 1—3;

Fig. 5 is a perspective view of another shaving system in accordance with the invention;

Fig. 6 is a side view, with parts broken away of the cartridge and handle components of the shaving system shown in Fig. 5;

Fig. 7 is an enlarged view showing aspects of the geometry of the shaving system shown in Fig. 5;

Fig. 8 is a perspective view of still another shaving system in accordance with the invention;

Fig. 9 is a side view with parts broken away of the platform and handle component of the shaving system shown in Fig. 8;

Fig. 10 is a sectional view taken along the line 10—10 of Fig. 9;

Fig. 11 is a top view of the structure shown in Fig. 9;

Fig. 12 is a top view of the cap member of the shaving system shown in Fig. 8;

Fig. 13 is a sectional view taken along the line 13—13 of Fig. 12;

Fig. 14 is a sectional view taken along the line 14—14 of Fig. 12;

Fig. 15 is a plan view of the blade elements employed in the shaving system shown in Fig. 8)

Fig. 16 is an enlarged sectional view taken along the line 16—16 of Fig. 8; and

Fig. 17 is a further enlarged view showing aspects of the geometry of the shaving system shown in Fig. 8.

The razor system shown in Figs. 1 and 2 includes a handle portion 10 and a head portion 12 in which a double edged blade B may be clamped for use in shaving. Head portion 12 includes guard structure 14, platform structure 16, and a pair of swingable cap sections 18 for clamping the blade B against the platform 16 with its cutting edges in shaving relation with respect to guard 14. Replacement of the blace B is ff cted by a system of m chanical elements which includes tubular handle member 20 and knob 22. Rotation of knob 22 moves stem 24 to which is secured a spider 26 on which are pivotally mounted cap sections 18. As the stem 24 and spider 26 moves up, in response to rotation of knob 22, cap projections 28 engage the under surfaces of the platform 16 causing the cap sections 18 to swing outwardly to a fully open position. In this position, an old blade may be removed and a new blade may be placed on the razor head, resting on platform 16. The new blade may be clamped on the platform by imparting reverse rotation to knob 22, lowering stem 24 and causing cap sections 18 to swing inwardly towards each other and into blade clamping position.

The blade B is fixed in position by guide structures carried by spider 26 to position the blade edge 30 in a predetermined position coincident with a predetermined reference line. A hair engaging supplemental member 32 having a hair engaging edge 34 is fixed in position between each guard 14 and platform 16. The edge 34 extends along a line parallel to the blade edge 30. In the embodiment shown in Fig. 3, member 32 is made of plastics material and is integral with the guard and platform structure and the edge 34 has a radius of 50 microns. In fact, the platform structure 16, guard structure 14 and supplemental member 32 are all made of plastics material. Edge 34 is located so that it is positioned on the skinward side of plane 36 that extends from the forward edge of platform 16 to a tangent to the surface of guard 14; and in plane 38 that extends from blade edge 30 to a tangent to the surface of guard 14. In this position edge 34 may be considered to have zero exposure. The center of radius of edge 34 is positioned about one and one-half millimeters from edge 30 and about one and one-half millimeters from the tangent line of plane 38 on guard 14.

In a shaving stroke, the razor is positioned so that surfaces of guard 14 and cap 18 are in contact with the skin as shown in Fig. 4. As the razor is moved along the skin, the surface of guard 14 engages beard hair 40A and bends it over against the surface of the skin. Due to the relatively large radius of the guard surface, no significant outward force is exerted on th beard hair 40A. When the interposed edg 34 engages a beard hair (e.g. hair 40B), however, due to its radius that is the same as the radius of a 100 micron diameter beard hair, it produces localized distortion as indicated diagrammatically at 42 in the nature of a grasping effect, and movement of the razor causes the edge 34 to exert a pulling force on the engaged hair element 40B that moves it outwardly from its hair follicle 44 as indicated by arr w 46. As movement of the razor continu s, the beard hair (e.g. hair 40C) is released by dge 34, and starts to

retract as indicated by the arrow 48. Before the beard hair 40C can return to is original lcoation in its follicle, the movement of the razor causes blade edge 30 to engage the hair element 40C and that movement drives the cutting edge 30 through the beard hair in a severing action. After the beard hair has been severed, the cut end (e.g. of diagrammatically indicated hair element 40D) is further retracted by the action of the hair follicle as indicated by the arrow 50.

Another embodiment is shown in Figs. 5—7. With reference to Figs. 5 and 6, the shaving system there illustrated includes a razor blade cartridge 52 arranged to be secured in a handle member 54.

The cartridge member 52 includes a platform structure 56 on which a band blade B is disposed. Blade B extends from supply chamber 58 across platform 56 and is connected to a take-up arbor which is driven in rotation by handle 60. Overlying platform 56 are four projections 62 which assist in maintaining the blade B on the platform. Guide surfaces 64 at the rear of platform 56 provides a reference for positioning the blade edge 66 in a predetermined position. When the carriage 52 is inserted in the handle 54, cap portion 68 of the handle clamps the blade B against platform 56 as indicated in Fig. 6.

Formed integrally and disposed forwardly of platform 56 is a guard structure 70, and disposed between platform 56 and guard structure 70 is a supplemental member 72 which defines at its leading edge a hair engaging edge structure 74 that has an effective edge radius of about thirty microns. Edge structure 74 is supported in spaced relation between platform 56 and guard 70 by spaced ribs 76 such that edge 74 extends parallel to the cutting edge 66 of blade B.

As shown in the diagrammaatic view of Fig. 7, edge 74 is located so that it is positioned on the skinward side of plane 36' that extends from the forward edge of platform 56 to a tangent to the surface of guard 70; and twenty microns above plane 38' that extends from blade edge 66 to a tangent to the surface of guard 70. In this position, edge 74 may be considered to have positive exposure with respect to the skin engaging surfaces immediately forward and to the rear of that edge structure. In this embodiment, edge 74 is positioned about one millimeter from edge 66 and about one millimeter from the tangent line of plane 38' on guard 70. In other embodiments, guard 70 and/or supplemental structure 72 may be arranged for adjustment over a limited range of positions to vary the geometry of the shaving system. The operation of this shaving system is similar to the operation of the system described above in connection with Fig. 4, edge 74 producing localized distortion of the hair element that it engages and pulling the engaged hair element outwardly from its hair follicle as the shaving system is moved along the skin, and then releasing the hair element prior to cutting by blade edge 66.

Still another embodiment is shown in Figs. 8—17. That razor system includes a base member 100 and a cap member 102, each molded of high impact polystyrene. As seen in Figs. 9—11, the lower portion of the base member forms a handle portion 104 and the upper portion forms a head portion 106 which includes two spaced surfaces 108 and a downwardly curved surface 110 intermediate surfaces 108 which forms a recess or depression. Spaced above surface 110 is a bridge structure 112, the lower surface 114 of which is curved complementary to surface 110 so that an open area is defined between surfaces 110 and 114. Formed in bridge structure 112 are two inclined platform structures 116 and two associated supplemental structures 118. Each supplemental member 118 has a width of about three-quarter millimeter and its upper surface 120 is inclined at an angle of 15°. Hair element grasping edge 122, formed between surface 120 and the inner vertical wall of supplemental member 118, has a radius of about 20 microns. The inner walls of members 118 are spaced about one and one-half millimeters apart and the adjacent edges of the two blade support platforms 116 are spaced about four millimeters apart. Ribs 124 extend between platform structure 116 and the supplemental structures 118. There are two rectangular apertures 126 in each platform structure; two recesses 128 at the rear edge of each platform structure; and a latch recess 130; is formed at either end of each platform.

The cap component 102, details of which may be seen in Figs. 12—14, is designed to fit on the bridge structure 112 of the base component. The cap component includes a generally rectangular frame 136 which has two side members 138 and two end members 140. Projecting inwardly from each side member 138 is a canti-levered cap portion 142, which is inclined upwardly at an angle of about 25° and has a clamp surface 144 at its outer end and two blade aligning webs 146 adjacent at its inner end. Two pins 148 extend downwardly from each cap 142. Two latch structures 150 project inwardly from each end member 140. Each latch structure includes a lower camming surface 152 and an upper latch surface 154. Also carried by each end member 140 are two aligning projections 156. Frame surface 158 is adapted to seat on surfaces 108 on the base with pins 148 extending through apertures 126 when latch surfac s 154 ar in

cooperating ngagement with latch recess 130 of the base.

Two blade elements 160 are empl yed in this shaving system, each of which has a sharpened blade edge 162, two apertures 164, and a rear blade edge 166, as shown in Fig. 15.

The assembled relationship of blades 160, base component 100 and cap component 102 may be seen in Fig. 16. In assembly, each blade 160 is positioned with cap pins 148 extending through apertures 164 with each end of a blade edge 162 in engagement with aligning projections 156 and the rear edge 166 of each blade resting on the inclined surfaces 168 of aligning webs 146. Thus the major portion of the body of each blade 160 is supported clear of the cap 142 so that the blade edge 162 slides forwardly against alignment projectins 156. The base 100 is then attached to the cap 102 by inserting pins 148 into apertures 126 and forcing camming latch surfaces 152 past the cooperating latch recesses 130 of the base to secure the cap and base together. In this position, cap frame surface 158 is seated on base surfaces 108, as indicated in Fig. 16.

The resulting geometry is indicated in Fig. 17. As there indicated, each edge 122 is located on the skinward side of the plane 170 that extends from forward edge 123 of each platform 116 to the other supplemental edge 122; and about 50 microns above the plane 172 that is defined by the blade edge 162 and the other supplemental edge 122 (a slight positive exposure). Each edge 162 is positioned about 50 microns above the plane 174 defined by the immediately adjacent supplemental edge 122 and a tangent to cap 142.

The arrangement provides a bi-directional shaving system in which shaving may be effected with a stroke in either of two opposite directions. In each shaving stroke, the leading blade and the leading supplemental member 118 function as guard structures which slide over the hair elements. However, the edge 122 of the supplemental structure 118 closer to the active blade edge 162 functions to grasp and exert a pulling force on the engaged hair elements to move them outwardly of the hair follicles. The grasped hair elements are released prior to engagement by the cutting edge 162 and are retracting into their follicles when they are engaged by the active cutting edge 162 which is driven through the hair elements in a severing action. After the hair elements have been severed, their cut ends are retracted by action of their hair follicles. Reversal of the direction of the shaving stroke begins the other cutting edge 162 into action, together with its adjacent edge structure 122. The spaces between the supplemental memb rs 118 and platforms 116 provide flow passages for removal of debris from the shaving area and the large opening between surfaces 110 and 114 facilitate flushing of shaving material from the razor.

WHAT WE CLAIM IS:—

1. A shaving system comprising a blade member having a cutting edge, a platform member of molded plastics material supporting said blade member, a skin engaging guard of molded plastics material positioned forwardly of said cutting edge, and a supplemental member of molded plastics material and integral with said platform member and said guard fixed in position between said guard member and the cutting edge of the blade member, said supplemental member having a hair-engaging edge portion disposed parallel to the cutting edge, said hair-engaging edge portion having a radius relative to the diameter of har elements to be shaved such that, in the course of a shaving stroke, said edge portion engages hairs and produces localized distortion therein to exert a grasping effect on the individual engaged hairs which pulls them outwardly from their follicles as the shaving system is moved over the skin surface.

2. A system as claimed in claim 1, wherein the edge of the supplemental member has a radius in the range of 2—50 microns.

3. A system as claimed in claim 1, wherein the edge of the supplemental member is positioned in the range of about three-quarters to two millimeters from and parallel to the cutting edge of the blade member.

4. A system as claimed in claim 1, wherein the perpendicular distance of the edge of the supplemental member form a plane defined by the skin-engaging guard and cutting edge is in the range of −20 to +50 micron

5. A system as claimed in claim 4, wherein the blade member is disposed at an angle in the range of 20—32° to said plane.

6. A system as claimed in claim 5 including a second blade and associated supplemental member disposed in symmetrical, opposed relation to the first blade and supplemental member engaging edge portion.

7. A system according to any one of the preceding claims, in which the blade member is clamped between the platform member and a cap member.

8. A shaving system according to claim 1, wherein the blade meber has a forward sharpened cutting edge and a rear edge, said system further including a cap member of molded plastics material having a first alignment surfac means engaging said forward edge of said blad member and an

inclined alignm nt surface means engaging said rear edge of said blade member, said inclined surface positioning said blade member so that a major portion of said blade member is supported clear of said cap member, said blade member being clamped between said platform member and said cap member, and means permanently securing said platform member, said blade member and said cap member together as a rigid unit.

9. A system as claimed in claim 8, wherein said first alignment surface means includes a pair of spaced aligning projections and said inclined alignment surface means includes a pair of spacing aligning webs, each having an inclined surface engaging the rear edge of said blade member and urging the blade member forwardly so that said cutting edge is in engagement with said aligning projections.

10. The shaving system substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 4, Figs. 5 to 7 or Figs. 8 to 17 of the accompanying drawings.

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Sheet 1

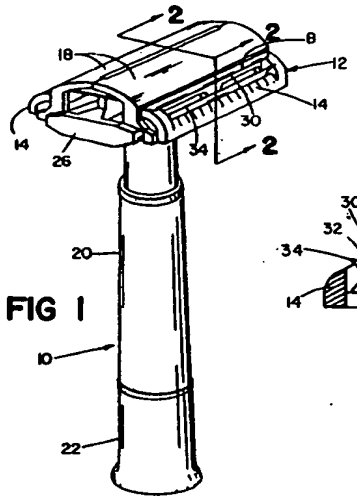
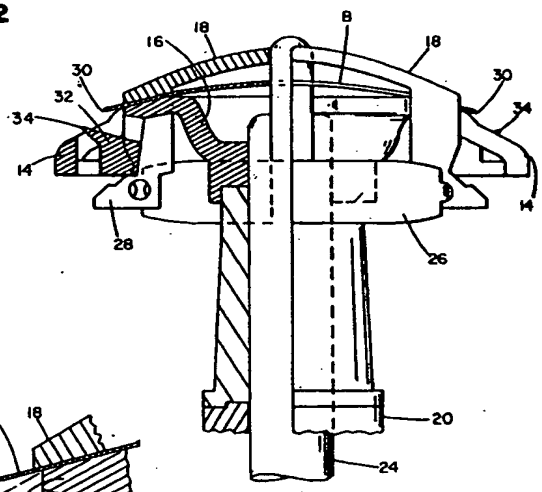


FIG 1

FIG 2



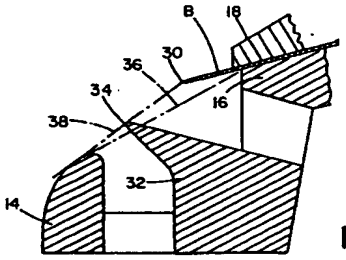


FIG 3

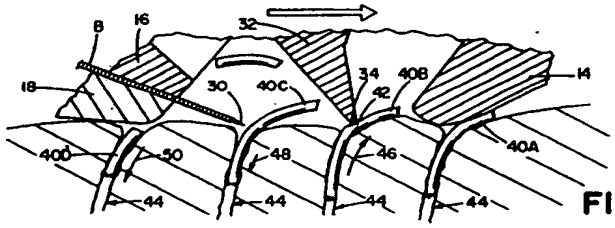


FIG 4

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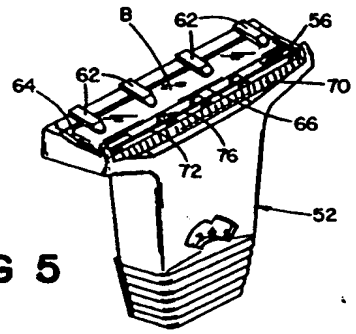

FIG 5

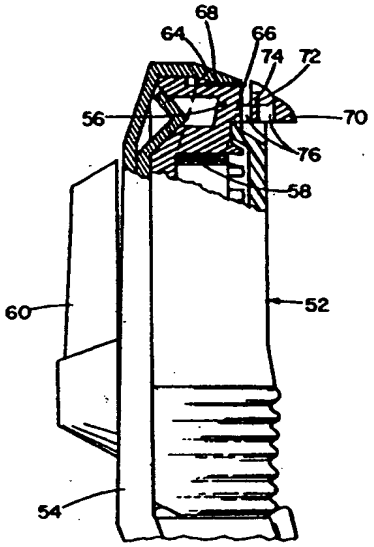

FIG 6

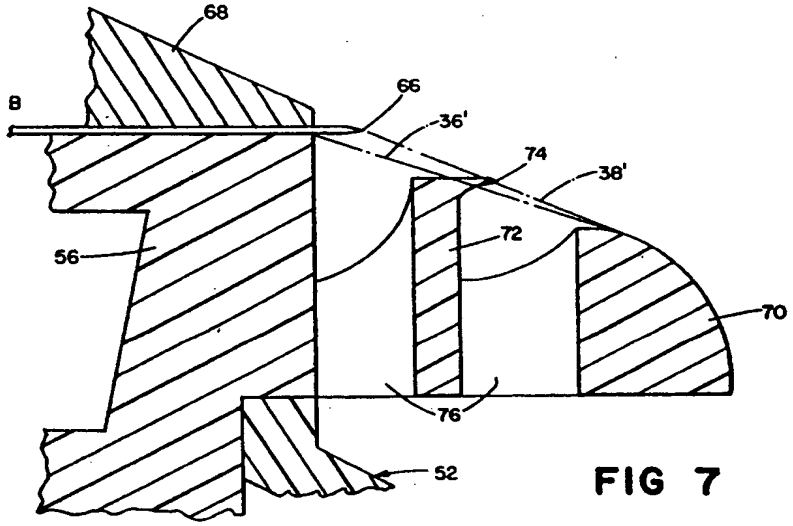

FIG 7

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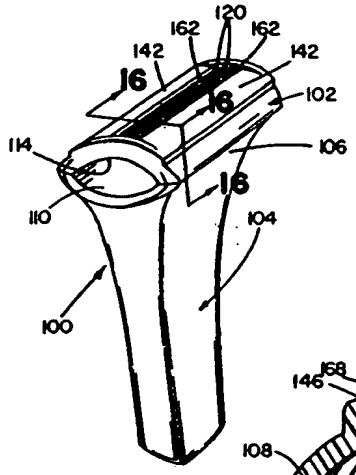

FIG 8

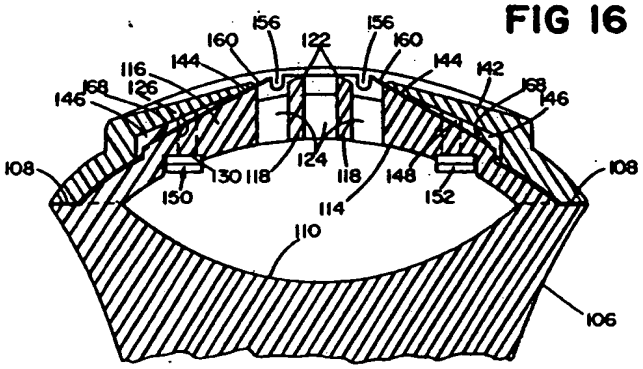

FIG 16

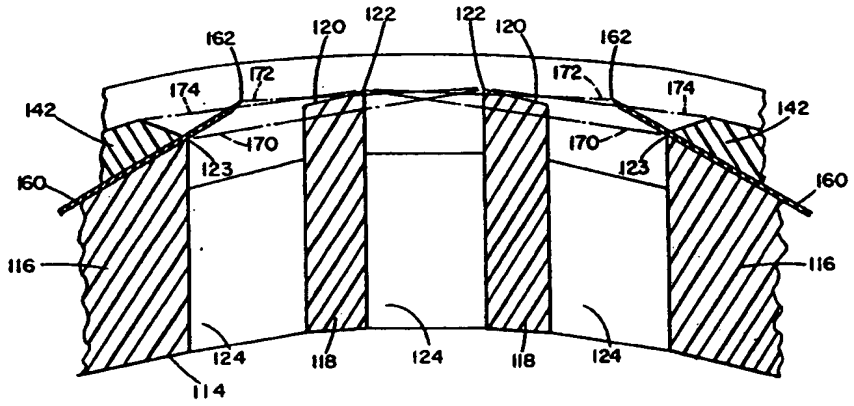

FIG 17

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Sheet 4

FIG 12

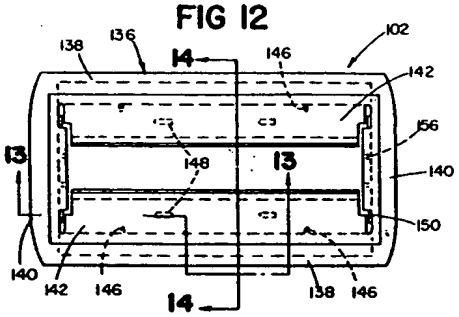


FIG 13

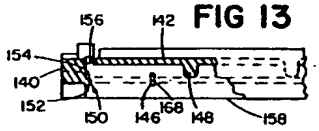
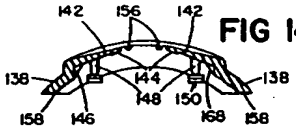


FIG 14



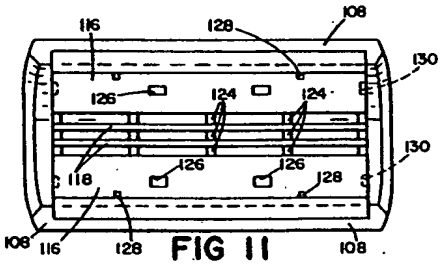


FIG 11

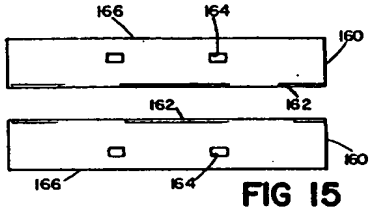


FIG 15

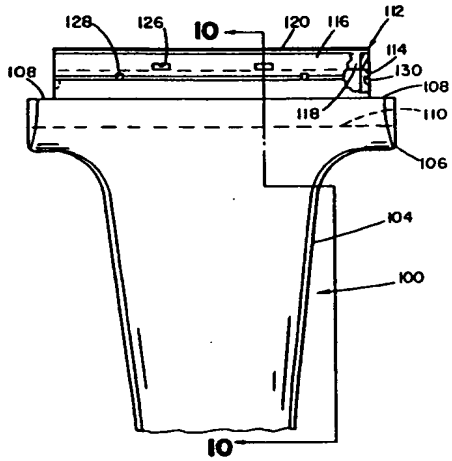


FIG 9

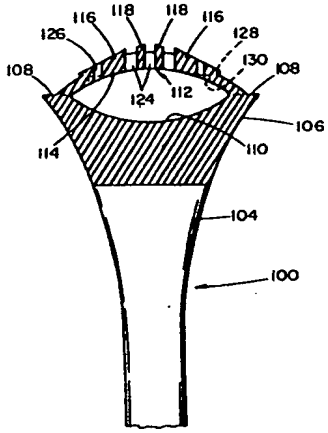


FIG 10